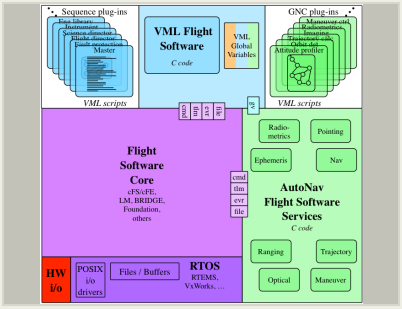
AutoNav Mark 4: Autonomous Navigation Software, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

The growing number of missions in deep space, from Discovery class missions like Psyche and Lucy down to very small spacecraft like Lunar Flashlight, is driving the need for standardized, flexible, full-featured flight software for spacecraft guidance, navigation, and control (GNC). Autonomous GNC allows a spacecraft to perform most of its own navigation activities without the need for ground-based personnel and DSN time, reducing cost and required DSN contact time, saving money, and allowing specialized navigation personnel from different NASA centers to be easily shared among missions. Autonomous GNC activities include: -spacecraft positioning absolute and relative (helio, planet, small-body) relative to small bodies, other spacecraft for rendezvous -orbit determination -target tracking of bodies, apertures, spacecraft, ground-based assets -trajectory derivation -low-thrust maneuvering for Solar Electric Propulsion (SEP) -ephemeris calculations AutoNav from the Jet Propulsion Laboratory implements these functions, and components have flown on Deep Space 1 and Deep Impact. With an appropriate application of software development process to reengineer the code, a new AutoNav Mark 4 could be made available as a commercialized product meeting NASA Class B software standards, thereby enabling its easy inclusion on a wide variety of NASA and non-NASA missions. AutoNav Mark 4 source code is designed and tested to be compatible with a variety of different CPUs (e.g. SPARC, PPC, Intel), real-time operating systems (VxWorks, RTEMS), and flight software cores like NASA Core Flight System. This approach allows AN4 to be deployed in the widest-possible set of environments: -within STRS-compatible space radios (e.g. Iris) -in the flight software load of the spacecraft C&DH -in a dedicated stand-alone instrument like the Deep Space Positioning System AutoNav Mark 4 provides highly capable autonomous GNC while saving missions money.



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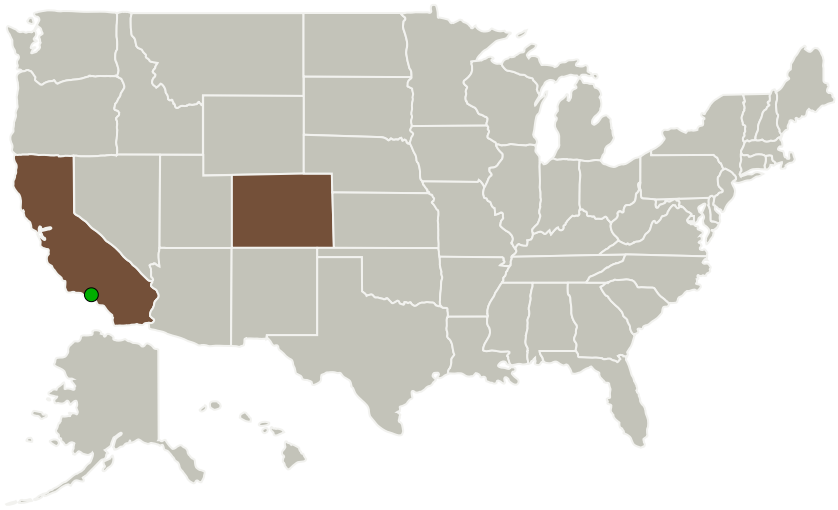
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Blue Sun Enterprise, Inc.	Lead Organization	Industry	Boulder, Colorado
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Colorado

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Blue Sun Enterprise, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

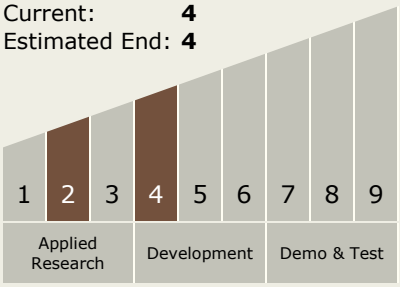
Carlos Torrez

Principal Investigator:

Christopher A Grasso

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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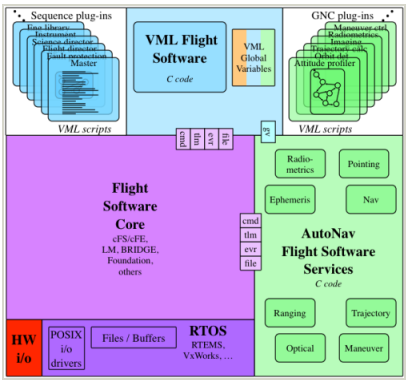
Images



Briefing Chart Image
AutoNav Mark 4: Autonomous Navigation Software, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/131089)*

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors